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PATENT ABSTRACTS OF JAPAN

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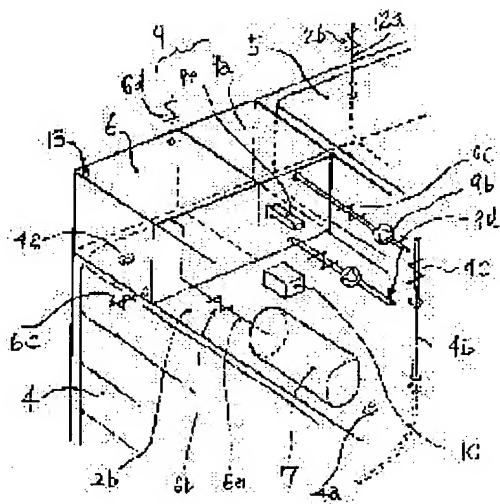
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(54) SUBMERSIBLE TANK BARGE AND ITS TRANSPORTATION METHOD-2

(57)Abstract:

PURPOSE: To transport much water at low cost with an unmanned barge submerging without propelling device by making submerging and floating, making air filling to a floating tank for buoyancy adjustment from a towing ship, and making air filling for buoyancy adjustment to a balance tank from an air storing tank.

CONSTITUTION: For loading water into a barge, a water tank is extended and expanded downward as water is filled in it. Also, because a difference in specific gravity between sea water and fresh water is approx. 0.03, a buoyancy is produced as loading is proceeded (as water is poured). Adjustment is made so that the total of a large buoyancy of a water (cargo) tank 4 at full loading and a small buoyancy of a balance tank 6 is slightly larger than the self-weight of the barge. Therefore, at full loading, the buoyancy of a floating tank 5 is not required, and air is released from an air inlet/outlet pipe 12a and an air inlet/outlet valve 12b. Namely, even if the buoyancy of the floating tank 5 is not present, the barge at full loading is maintained to float on the sea.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This inventions are the equipment which dives **** of Yaku Islands to a large quantity (tens of thousands of t/(day)) into the seaside city of a mainland in the Japan Current ocean current in detail with respect to the equipment of the water transport in a sea route, and is conveyed, and mode of transportation.

[0002]

[Description of the Prior Art] Although the so-called Tanggu (water tanker) is used for carrying water in a sea route, it is about hundreds of t at most. Although the water of a lot of low prices of a 10,000t unit is carried between long distances, **** increases by the large-sized oil tanker and the same method, and there is a problem on cost, such as needing costs, such as ****, remarkable operation cost, i.e., maintenance, and a fuel.

[0003]

[Problem(s) to be Solved by the Invention] this invention -- a full-load burden condition -- an ocean current (Japan Current) -- diving -- uninhabited -- and -- It is offering the equipment which carries water in large quantities and cheaply, without using a propulsive engine, and the mode of transportation which consists of this equipment and towage.

[0004]

[Means for Solving the Problem] The plate-like structure, this structure bottom, the elasticity cargo tank of the letter of good deformation (capacity) kept in the interior of

periphery hanging ballast, The elasticity buoyancy tank of the letter of good deformation (capacity) kept in the interior of this structure, a fixed form-like rigidity balance tank, A **** tank and a stabilizer (restoration stabilizer), cargo work and a mooring facility, It constitutes from the pipe line and a control system which contains a water pressure sensor, an inclinometer, a communication device, etc. centering on an adjustment control unit. In the case of a loading condition, by the buoyancy of a cargo tank, and the buoyancy of a balance tank In the case of an unloaded state, by the buoyancy of a buoyancy tank and the buoyancy of a balance tank which ****(ed) A *****-like condition is held and **** in a loading condition and an unloaded state, diving, and surfacing are performed by adjustment of the buoyancy of a balance tank, It is the diving type tank barge which performing **** of the ballasting-up to a buoyancy tank from towage and adjustment **** to a balance tank are performed barge] from a **** tank, and restores a heel with a stabilizer further. And it is the mode of transportation by the diving type tank barge by which a **** bringing a ship is carried out, a barge diving into an ocean current and moving it to it independently, by uninhabited, by the loading condition, and diving similarly, the rope for **** and a supplied-air pipe, a communication link, a power line, etc. being connected from the towage equipped with air feeding equipment etc. at the time of an empty load, and control of impregnation of air etc. also being performed to a buoyancy tank.

[0005]

[Function] In the tank barge of the above configurations, at the time of the empty load which is not loading the cargo tank (it is also called a water tank below) of the elasticity of the letter of good deformation with the water which is a cargo, it has contracted and a water tank will be in the **-like condition that the sum total of ***** buoyancy and the proper buoyancy of the configuration member of a barge itself balances with a barge self-weight, and appears on the air in a buoyancy tank and a balance tank on a sea surface. That is, what deducted the proper buoyancy of the barge itself from the barge self-weight can be said that it is enlarging sum total buoyancy of a buoyancy tank and a balance tank, and a barge will be in a **-like condition from an appearance self-weight (a self-weight is seen and means a self-weight below), then this self-weight on a sea surface.

[0006] In a loaded condition, the sum total of a big buoyancy of the cargo (water tank) produced because of the small specific gravity difference (about 0.03) of seawater and the water which is a cargo, and a buoyancy ***** to the air in a balance tank balances with the self-weight of a barge mostly, and will be in a **-like condition on a sea surface. Since the buoyancy of a buoyancy tank means becoming excessive and becomes the hindrance of **** and diving, this emits the air in a

buoyancy tank and abolishes this buoyancy.

[0007] And he dives the full-load barge of a ** -like condition into about 40m under a sea surface by reducing, the air content, i.e., the buoyancy, of a balance tank, and leaves it to an ocean current as it is. There is no propulsive engine, is fuel needlessness and carries out diving drift by uninhabited. If this depth of water is held, the collision with the ship which navigates on [the sea] is [nothing] and is safe. If it arrives at the target seaside city adjacent-seas region, by the command of the adjustment control device by timer automatic actuation or the non-cable actuation from towage (it is also called a tugboat below), air will be risen to surface from a high ***** tank to a balance tank on the increase of delivery buoyancy, and a sea surface. since a pipe etc. is connected with a tugboat, air is further fulfilled also to a buoyancy tank, after being in a ** -like condition on a sea surface, and buoyancy is added -- cargo work -- that is, water will be pumped up.

[0008] After pumping termination, a barge will be in an unloaded state, will lose cargo buoyancy, and it will carry out [barge] the shape of ** by the buoyancy of a buoyancy tank and a balance tank. After a tugboat, a rope, etc. connect this tank barge, it is made to dive into 10m or less under a sea surface again by emitting air in part from a balance tank. In order to prevent the volume of a buoyancy tank, i.e., buoyancy, decreasing with the water pressure which increases according to ****, also in this case, by the actuation command of an adjustment control device, air is poured into a buoyancy tank with a **** pipe from a tugboat, the pressure in a tank is heightened, and that volume (buoyancy) is held almost uniformly henceforth. The **** bringing a ship of the empty load barge which dived after that is carried out from marine to Yaku Islands whose tugboat is the source of a stream. Henceforth, water is conveyed safely [in the repeat of the same actuation], and cheaply.

[0009]

[Example] Hereafter, the diving type tank barge and mode of transportation of this invention are explained based on drawing 1 - drawing 8 . The diving type tank barge 1 [drawing 1] uses the monotonous rectangular parallelepiped-like structure (it is also called a pontoon below) [drawing 2] 2, the steel flexible shape rigidity balance tank 6 of the letter elasticity cargo(water) tank 4 of periphery hanging ballast 3 [drawing 3] good deformation [drawing 4], and a letter elasticity buoyancy tank of good deformation 5 [drawing 2] fixed form [drawing 2], and the steel high ***** tank 7 [drawing 6] as the main components.

[0010] Like drawing 2 , the structure (pontoon) 2 is steel and is carrying out the shape of a monotonous rectangular parallelepiped. Top-face 2a, base 2b, etc. consist of a

steel plate, shape steel, etc. Reticulated facing 2c is stuck on the periphery of this pontoon 2, therefore receipts and payments of the seawater to the interior are free.

Periphery hanging ballast 3 like a "shop curtain" with an eye coarse so to speak which sets fixed spacing and hangs down in the condition of enclosing a water tank 4 is located in a line with this periphery in parallel [drawing 3].

[0011] This periphery hanging ballast 3 is extended from the hydraulic winch 8 of the top face of a pontoon 2, it hangs down from a pontoon periphery, and **** 3b is attached at the tip of rope 3a of a large number which arrive at below a tank base so that the side-face perimeter of a water tank 4 may be enclosed. **** 3b is mutually connected with fixed spacing so that it may not tangle each other, and when a water tank is empty, it can be wound up by the winch 8 to near a pontoon side face. [Drawing 5]

[0012] Like drawing 2 , the flat letter elasticity buoyancy tank 5 of good deformation which occupies most part of a pontoon 2 is combined by base 2b and 2d of two or more free bond parts. Moreover, there is a fixed form-like rigidity balance tank 6 of small capacity about four corner 2e of this pontoon 2, and seawater bulb 6c which connection pipe 6a which connects this balance tank to the high ***** tank 7, air bulb 6b, and seawater frequent, and emission bulb 6d are attached still like drawing 6 .

[0013] The stabilizer (stabilizer) [drawing 2 and drawing 6] 9 which discovers a restoring moment is before and after a buoyancy tank 5. This stabilizer pressure-resistant space 9a of this capacity in the both-sides section of a pontoon Each pump 9b, Each bulb 9c is minded. An epilogue, water, and air by two pipe 9d Every moiety ***** By filling water with pump 9b to the near space which went up air to the space of the side which fell in the heel by the command of the adjustment control unit 10 which has connected inclinometer 9e, a restoring moment is made to discover and the restoration from a heel is urged.

[0014] Under the pontoon 2, it is in base 2b and the contact condition of a pontoon, is not joined firmly, and has joined by free contact connection 4a at two or more places, and the water tank 4 settled inside the periphery hanging ballast 3 is connected through flexible notes column pipe 4b and notes pumping bulb 4c [drawing 6].

This water tank 4 will extend, if it is made from plastics or the film material of rubber, and it is flexible and elastic and air or water is filled, and it becomes rectangular parallelepiped-like. In the case of an empty load, a water tank can wind up two or more ropes 11 connected with the pars basilaris ossis occipitalis by hydraulic winch 8a, and is bound by the pontoon inferior surface of tongue [drawing 5].

[0015] Moreover, the periphery hanging ballast 3 is [0011]. It is the configuration which was come out of and described, and while the water tank which is going to come floating prevents disturbing from under a pontoon, the center of gravity of the barge at the time of a full load is made low, and it contributes to stability.

[0016] The tank barge 1 made into the above basic structures performs cargo work, i.e., the loading of water, first in Yaku Islands. At this time, the barge is in the **'-like condition that air is poured in and a buoyancy tank 5 and the balance tank 6 appear at sea by that sum total buoyancy. Moreover, it also fills up the high ***** tank 7 with high-pressure air. The water which is a cargo will be poured into a water tank 4 from land through notes column pipe 4b and notes pumping bulb 4c in this condition [drawing 6]. (load)

[0017] In the case of the cargo work who loads a barge with water, it takes to the irrigation to a water tank, and the tank is elongated and expanded to down. Moreover, since there is a specific gravity difference of seawater and fresh water abbreviation 0.03, buoyancy is produced along with cargo work (water impregnation). The sum total of a big buoyancy of the water (cargo) tank 4 in a loaded condition and a small buoyancy of the balance tank 6 is adjusted somewhat more greatly than a barge self-weight. Therefore, in a loaded condition, the buoyancy of a buoyancy tank 5 becomes unnecessary and emits air by fill and drain mind pipe 12a and fill and drain mind bulb 12b [drawing 6]. That is, even if there is no buoyancy of a buoyancy tank 5, the barge of a loaded condition holds the **'-like condition of floating on a sea surface.

[0018] The air of the balance tank 6 is emitted for the full-load barge after cargo work completion in Yaku Islands by emission bulb 6d, and it is made to **** to about 40m under a sea surface by reducing [drawing 6 which opens seawater bulb 6c to coincidence, and introduces seawater into it], i.e., buoyancy. Closing these bulbs 6c and 6d after this, a barge will move according to an ocean current (Japan Current) as it is. If this depth of water is held, the collision with the ship which is hardly influenced of the billow at the time of heavy weather, and navigates on [the sea] is [nothing] and is safe. Of course, a barge is uninhabited. If it arrives at the target seaside city adjacent-seas region, by the operator command of timer actuation or the non-cable from a tugboat 12, high-pressure air will be sent to the balance tank 6 through connection pipe 6a and air bulb 6b from the high ***** tank 7, seawater bulb 6c will open to coincidence, seawater will be extruded, buoyancy will increase, these bulbs will be closed after that, and [drawing 6] and a full-load barge will surface on a sea surface.

[0019] Since the buoyancy of a cargo(water) tank decreases and goes when pumping up water from the tank barge 1 through notes column pipe 4b and notes pumping

bulb 4c to land, air is enough poured into [drawing 6] and a buoyancy tank 5 through supplied-air pipe 12c from the tugboat beforehand equipped with air feeding equipment etc., and pumping is started after adding the maximum buoyancy. Since it takes to pumping, a cargo(water) tank is contracted and transformed and the buoyancy is lost after pumping, i.e., cargo work termination, the barge used as an empty load will be in the **'-like condition of floating by the small buoyancy of the balance tank 6, and the big buoyancy of a buoyancy tank 5. The cargo(water) tank 4 contracted at this time is [0014]. It is bound by the appearance come out of and described at the pontoon bottom. The periphery hanging ballast 3 can be similarly wound up near the side face of a pontoon [drawing 5].

[0020] Before starting the diving **** bringing a ship in an empty load, a barge 1 and DAGUBOTO 12 are further connected through rope (or chain) 12d for ****, and a control communication wire and power line 12e [drawing 7]. Air is emitted from emission bulb 6d from the balance tank 6 in this condition, if seawater bulb 6c is opened to coincidence and seawater is introduced into it, buoyancy will decrease and a barge will start **** by uninhabited. And if this seawater bulb 6c is closed adjusting the burst size of air, it will **** in [drawing 6] and depth of water of 10m or less. In order to prevent the buoyancy of the flexible adjustable elasticity buoyancy tank 5 by the water pressure which increases in connection with **** at this time, i.e., reduction of the volume, From the TAGUGU boat 12 [drawing 7], air is poured into a buoyancy tank 5 through supplied-air pipe 12c, fill and drain mind pipe 12a, and fill and drain mind bulb 12b, the pressure in a tank is adjusted more greatly than the water pressure, the volume (buoyancy) is adjusted almost uniformly henceforth, and the depth of water of a barge is held almost uniformly.

[0021] And the **** bringing a ship of the tank barge of an empty load is carried out in the state of diving as it is to Yaku Islands which are the source of a stream. A water tank 4 is [0014]. The fuel consumption of **** according [since it is bound by the pontoon bottom and the periphery hanging ballast 3 can be similarly wound up like near the side face of a pontoon and near the water tank which were bound, the water resistance of a barge becomes small, and] to a tugboat boiled and described becomes small. Thus, 1 cycle of water conveyance will be completed.

[0022] The effect of a tidal wave or a wave becomes the empty tank barge which dived with a destabilizing factor, namely, the increment in depth of water and water pressure and reduction compress and expand the flexible buoyancy tank 5 with a tidal wave or a wave, reduction in buoyancy and an increment are brought about, and much more **** of a barge and surfacing are produced. It is [0020] when a limit with this **** and surfacing is exceeded. Similarly, air is exhausted from impregnation or

it to a buoyancy tank 5 by supplied-air pipe 12c from DAGUBOTO 12, buoyancy is adjusted, and a periscope depth range is kept almost constant.

[0023] Adjusting the air content of each balance tank 6, i.e., buoyancy, respectively based on the water pressure which the water pressure sensor 13 [drawing 6] attached to the exterior of the balance tank 6 which is the 4 corner sections of a barge measures, and adjustment of the restoring moment of a stabilizer 9 perform in the depth of water of a barge and maintenance of a posture which are diving by the loaded condition. [0024] That is, maintenance of depth of water is performed by the watertight pressure-resistant adjustment control device 10 processing the measurement water pressure of each water pressure sensor 13, and controlling air bulb 6b of each balance tank, seawater bulb 6c, and closing motion of emission bulb 6d. That is, depth of water is measured by the water pressure sensor 13 attached to barge four corners, and if the tank barge 1 **** about 40m, high-pressure air will be automatically sent into the balance tank 6 through connection pipe 6a and air bulb 6b from the high ***** tank 8. Seawater bulb 6c opens to coincidence, the seawater in the balance tank 6 is extruded, these bulbs are closed the increase of buoyancy, and after that, and the depth of water of a barge is held [drawing 6]. Conversely, when it rises to surface about 10m according to some causes, seawater bulb 6c and emission bulb 6d are opened, seawater is introduced in a balance tank, air is emitted, buoyancy is reduced, and surfacing beyond this is controlled. Actuation of this balance tank contributes also to control of a vertical (longitudinal direction) inclination. It distinguishes between the buoyancy of order, keeping constant the sum total of the buoyancy of the balance tank of order.

[0025] On the other hand, maintenance of a posture is the command of the ***** adjustment control unit 10 at the measured value of inclination sensor 9e, and is

[0013]. A stabilizer 9 operates to the appearance boiled and described, and a heel is controlled. This adjustment control device 10 performs closing motion of all bulbs and pumps, and control of start and stop, and adjusts the condition (depth of water, posture) of a barge, and enables the change to the cable from the communication device of a tugboat or non-wired remote control, and automatic actuation [drawing 8].

[0026] The maintenance of the depth of water of a barge by which diving **** is carried out with the unloaded state is the above [0022]. ** -- like -- the air injection to a buoyancy tank 5, and exhaust air -- it is -- moreover, maintenance of a posture -- [0024] It carries out by adjustment of the buoyancy of four balance tanks 6 similarly.

[0027] Although it is the case where one cargo(water) tank is dedicated to the structure (pontoon), the above may dedicate two or more cargo tanks, and arranges them in

the longitudinal direction of the pontoon of an abbreviation rectangle in this case. Periphery hanging ballast is installed almost like the above. Moreover, the shape of a disk and the ellipse board whose resistance is not limited in the shape of a rectangular parallelepiped, but decreases are sufficient as the configuration of a pontoon.

[0028] The air injection to a buoyancy tank may equip with a snorkel type diesel drive air pump the barge other than the above-mentioned method held from a tugboat. In adjustment of the buoyancy of a balance tank, the method which feeds this air to a high ***** tank, without emitting air all over the sea may be used. Moreover, the method which carries out air injection from a tugboat also to a balance tank is also good.

[0029] The configuration of a buoyancy tank is following. What pasted up rubber or plastics on the flexible inelasticity ingredient, for example, cloth, and was infiltrated is used, and if many inside of a tank is divided by the septum of free passage nature, even if it will pour increase and air into a buoyancy tank and will pressurize internal pressure-proof nature, it becomes an almost fixed flat configuration. Therefore, even if it pressurizes the pressure of a more than equivalent to the pressure of a periscope depth range (surplus pressure), the configuration and volume of the whole tank are almost fixed. Even if it reaches ***** and a schedule periscope depth range in the state of this surplus pressurization, a tank will hardly be compressed by water pressure, but will keep buoyancy constant, and becomes easy to hold fixed depth. In this case, the adjustment air content poured into a buoyancy tank from DAGUBOTO decreases, and buoyancy control also becomes easy.

[0030] In addition, it is good also considering this flexible buoyancy tank as proof-pressure steel. Buoyancy control becomes easier. However, the amount of the steel materials used increases and it becomes a cost rise. Moreover, it may be needed in the ballast and buoyancy for adjustment with a barge design specification. Moreover, the winch the object for periphery hanging ballast and for water tanks may be made to serve a double purpose. In this case, this periphery ballast and water tank will be connected in the lower limit section. Moreover, the battery as a power source required for control, a communication link, etc. is also carried. Moreover, the detail of many equipments, such as the associated equipment by the side of a tugboat (equipments, such as a remote control of many barge loading devices, a communication link, and *****) and the buoyancy control by the side of a barge, a communication link, NAV, cargo work, ****, and mooring, is omitted.

[0031] Japanese Patent Application No. 5-191573 and a name "a diving type tank barge and mode of transportation" are in the application relevant to this invention.

[0032]

[Effect of the Invention] The plate-like structure, periphery hanging ballast, and the cargo tank of the letter of good deformation can be used as main components, and the diving type tank barge constituted by dedicating the buoyancy tank of the letter of good deformation, four balance tanks, etc. to the interior of this structure holds a lot of water and the fluid-matter, it is using an ocean current and can convey a long distance cheaply. Furthermore, since diving migration of the inside of the sea is carried out, NAV of other ships is not barred, but the structure of a barge becomes simple by that it is safe and there is little effect of a wave, and the periphery hanging ballast configuration, and construction cost becomes low. And a cargo tank is contracted at the time of an empty load, and since it is bound, it is mode of transportation with the small fuel consumption of the **** bringing a ship by the tugboat. Moreover, this barge can also be used as stockpile equipment of water or petroleum, without moving.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing the ** -like condition of the diving type tank barge of this invention.

[Drawing 2] They are the configuration of the plate-like structure (pontoon) of the diving type tank barge of this invention, and the perspective view of the cargo tank of a burden condition.

[Drawing 3] It is the perspective view of the periphery hanging ballast in the full-load diving condition of the diving type tank barge of this invention. (A cargo tank binding rope is omitted)

[Drawing 4] It is the perspective view of the cargo tank of the diving type tank barge of this invention, and a binding rope. (Periphery hanging ballast is omitted)

[Drawing 5] It is the perspective view showing the situation which the cargo tank of the empty load of the diving type tank barge of this invention contracted, and was bound by the pontoon inferior surface of tongue.

[Drawing 6] It is the perspective view of the interior detail of a pontoon buttock of the diving type tank barge of this invention.

[Drawing 7] The situation that diving bringing a ship **** of the diving type tank barge of this invention is carried out with an unloaded state by tugboat is shown.

[Drawing 8] It is a control related Fig. centering on the adjustment control unit of the diving type tank barge of this invention.

[Description of Notations]

1 Diving Type Tank Barge, 2 Plate-like Structure (Pontoon), 3 Periphery Hanging Ballast, 3a A rope, 3b **** 4 A cargo tank, 4a Notes column pipe, 4b Notes pumping bulb 5 A buoyancy tank, 6 Balance tank, 6a A connection pipe, 6b An air bulb, 6c Seawater bulb 6d Emission bulb, 7 A **** tank, 9 Stabilizer 10 Adjustment control device 12 Towage (tugboat), 12a Fill and drain mind pipe 12b Fill and drain mind bulb 12c A supplied-air pipe, 12d Rope for **** 13 Water pressure sensor

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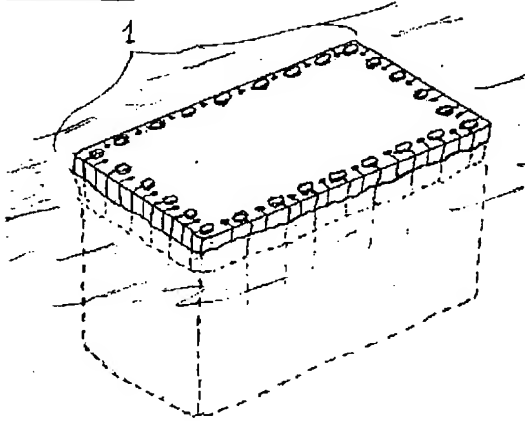
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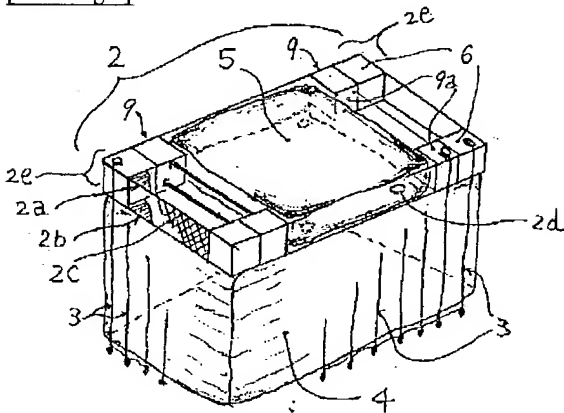
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DRAWINGS

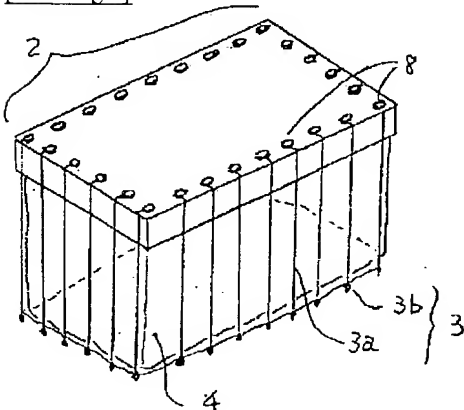
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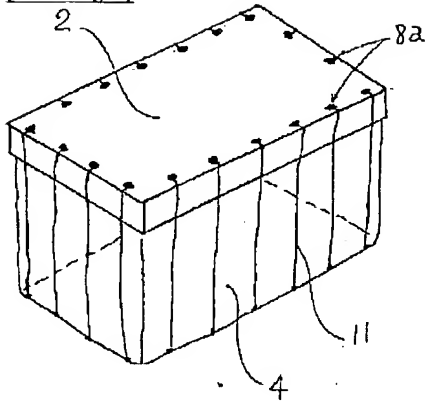
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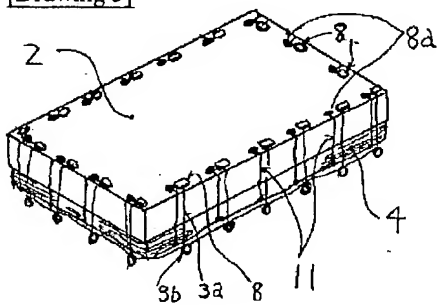
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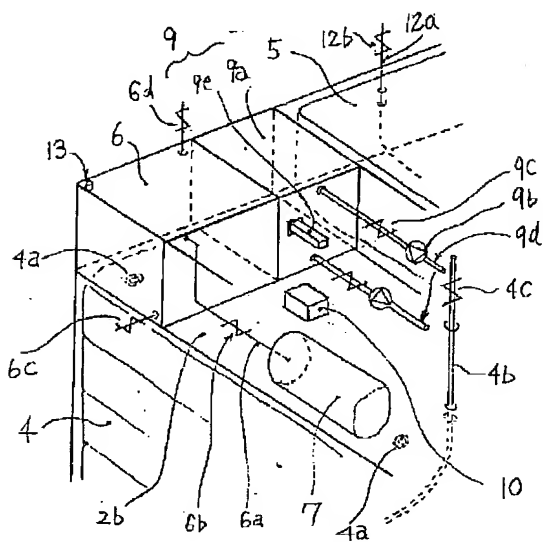
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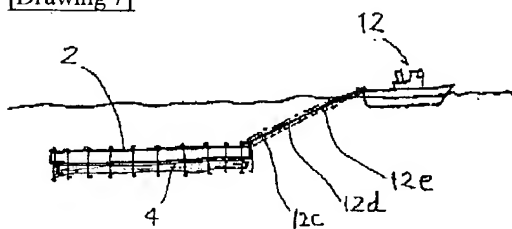
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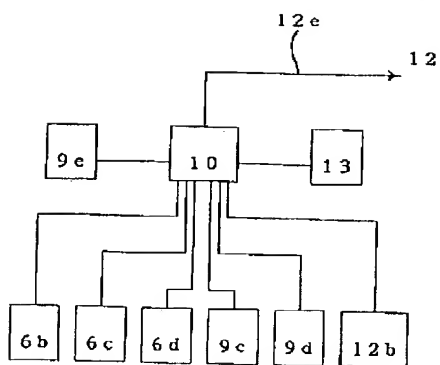
[Drawing 6]



[Drawing 7]



[Drawing 8]



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